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The plate to be discharged was then placed in the shadow of an opaque obstacle, and rays allowed to strike only the air near the plate. The form of the curve was not different from that obtained when the rays were partially screened off from both the plate and the surrounding air. These two experiments do not corroborate the theory of Perrin as given above.

It is also to be noted that the conditions in this last experiment were similar to those under which Perrin worked when he found the relations between the rate of discharge and the density of the gas, but the results which I found did not agree with the law as given by him.

There is also a fact in connection with this work which is worthy of note, although it does not directly bear upon the experiments here described. After the discharge had taken place the plate would often appear to recharge to a very noticeable degree. The electrometer used was a 'dead beat' electrometer. The recharging seemed to be more noticeable when the original potential was small, and the intensity of the rays great. My apparatus is not well adapted to study this phenomenon, nor have I had the time to do so. I hope hereafter to give a better proof of the existence of this phenomenon than I can at present offer, and to study the conditions under which it occurs more fully.

The experiments which I have described indicate a conduction effect through the gas rather than a convection effect due to particles thrown off from the discharging plate, but it would seem scarcely advisable to attempt to form a theory to explain these phenomena until they have been studied more completely.

Since writing the preceding I have investigated more completely the dependence of the rate of discharge caused by X-rays upon the potential used at different pressures of

the surrounding gas. I find that the limiting value of the current is sooner reached when the experiment is carried on at low pressures than it is at higher ones, and that the limiting values, called by Thomson and Rutherford saturation points, are roughly proportional to the square roots of the density of the gas.

Stoletow (*Journ. de Phys.* 9, 471) found that in the case of discharge caused by ultra-violet light the pressure of the gas at which a maximum effect occurred was proportional to the potential with which he was working. I have tested the discharge caused by the X-rays in this respect, and for this purpose I used much greater intensity of radiation than I had previously used. I found the pressure for maximum effect to be roughly proportional to potential of the charged plate. Also the intensity of the rays has a very great effect on the point of maximum effect. The greater the intensity the lower was this point.

I have also tried allowing the rays to strike the charged body at normal incidence, and the results were the same which I had previously found when the incidence was grazing.

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CURRENT NOTES ON PHYSIOGRAPHY.

CORNISH ON SAND DUNES.

MR. VAUGHAN CORNISH discusses the formation of sand-dunes (*London Geogr. Journ.*, ix., 1897, 278-309), and throws much light on their growth and movements. Basing his work on observation and experiment he discusses the effects of supply and texture of sand and of direction and strength of wind, and reaches satisfactory explanations of transverse, longitudinal and crescentic dunes (*barchanes* of Arabia, *medanos* of Peru), adding a suggestive hypothesis for the origin by wind-excava-

tion of the Arabian sand pits (*fulje*) of hoof-print form. Some of these described by Blunt are over 200 feet deep, revealing the hard floor on which the loose sand lies. The horns of the crescentic *medanos* point in the direction of wind motion, because, being lower than the middle, they travel forward faster, and thus run ahead of the larger mass. The extension of coast dunes in ridges transverse to the active winds is shown to depend more on the location of the sand supply (the beach) than on wind intention or 'sand tactics.' The longitudinal dunes of the Indian desert, parallel to the dominating wind, exhibit the more perfect mastery of the wind over the sand; they are best developed where the wind is strongest. Transverse dunes are compared to large ripples of sand and exhibit the relative mastery of the sand over the wind. The most effective way to check the encroachments of blown sands is to promote the growth of existing dunes by wattle fencing; thus the advance of individual dunes and the formation of new dunes to leeward are retarded.

PHILIPPSON ON GEOMORPHOLOGY.

DR. A. PHILIPPSON, of Bonn, has contributed a series of articles to Hettner's *Geographische Zeitschrift* (II., 1896, 512-527, 557-576, 626-639, 688-703), on the progress of the above subject, in which he recognizes two divisions: a dynamical chapter, concerned with the forces at work on the surface; and a systematic chapter, concerned with the classification of forms according to their characteristic features and their causes. Geological structure and stage of development (by which young, mature and old forms are distinguished) are not given prominent place. Attention is devoted chiefly to the processes by which form is determined; weathering, transportation by streams, snow, ice, and wind, and the action of the sea, are considered in some

detail, with numerous references to special articles; geomorphogeny, rather than geomorphology, being the leading theme. For example, under transportation by gravity, the determining conditions of landslips are briefly stated, but entirely apart from the structures and the stages of development in which landslips are characteristic and with little attention to the forms that they assume. While rational from the point of view of process, such a method seems empirical from point of view of form and, as such, characteristic of the current German method of study.

THORODSSEN ON NORTHEAST ICELAND.

K. KEILHACK gives an abstract in Petermann's *Mitteilungen* (XLII., 1896, 269-275) of Thorodssen's observations in northeastern Iceland in 1895. The Jokulsa delta formerly had a larger population, but is now in part laid waste by the gravels of its aggrading distributaries. South of the delta flat lava floods of great area spread around cones of moderate height; the lavas are seen to rest on glaciated dolerite. Indeed, all northeast Iceland bears marks of glaciation where not covered by younger lava flows and ashes. Fissures are noted at various points. East of the Jokulsa delta the broken ground is dislocated on the fissures. Lava flows issue from some fissures, and small craters are built over them. West of the delta fissures were formed during the earthquake of January 25, 1885, with small displacement of adjacent land blocks. The younger lava and tuffs of this region, both pre- and post-glacial, continue southward to the Vatna Jokull, apparently occupying a depressed district between the older basalts to the east and west.

VOLCANIC PHENOMENA OF 1894.

E. RUDOLPH, of Strassburg, continues the annual report on volcanic phenomena, previously prepared by Knüttel (Tschermak's *Min. u. Pet. Mitth.*, XVI., 1896, 365-464).

A special bibliography is given for each important volcanic district, followed by a brief summary of events, with frequent historical review. From an abundance of material the following may be noted: Falcon island in the Friendly (Tonga) islands ($20^{\circ} 20'$ S. lat.; $175^{\circ} 20'$ W. long). was first noted as a shoal in 1867. In 1877 smoke was seen ascending from the sea surface over the shoal. In October, 1885, an island had been formed 3,700 meters long and 75 meters high. At this time a terrific eruption was in progress, enormous clouds of constantly changing form rising over the island; earthquakes were felt on the neighboring islands and thundering sounds were heard on the southernmost island of the Fiji group, 325 kilometers away. In 1886 the island was estimated as 2,600 meters long and 50 meters high; in 1887 the height was 90 meters. In 1889 the length and breadth were 2,040 and 1,630 meters; the height was 47 meters. The adjacent sea bottom was 1,800 meters deep. The island consisted of ashes and has subsequently been greatly reduced by wave action. In 1892 its height was only eight meters, and its disappearance may be soon expected.

LIMESTONE RANGE OF THE KLONTHAL, SWITZERLAND.

DR. CARL BURCKHARDT, a pupil of Heim's, contributes the 35th number of the *Beiträge zur Geologischen Karte der Schweiz* (Monographie der Kreideketten zwischen Klönthal, Sihl und Linth; Bern, 1896, 205 p., maps and plates). It concerns a small district in which the structural features of successive eastward portions are, as it were, out of joint with each other; this being explained as the effect of a folding and shearing on north-south lines, oblique to another folding on roughly east-west lines. Most of the report is given to stratigraphy; the later pages treat *Oberflächengeologie*, but

less thoroughly than could be wished. A more detailed analysis of drainage lines might serve to determine the relative date of the two systems of folding, which is left in doubt. A characteristic feature of the work is a number diagrammatic views, drawn from nature by the author in a style closely resembling that of his master.

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CURRENT NOTES ON ANTHROPOLOGY.

NOTES ON AMERICAN CERAMICS.

THE device of the potter's wheel was unknown in either North or South America. A substitute for it is described as still in use among the Araucanians of Chili. It is a convex dish which is moved backward and forward on a smooth stone. Revolving in it, the clay is moulded to a symmetrically circular form. (*Globus*, Feb. 20.)

A cylindrical mug, with a handle, quite like a German 'Bierseidel,' was manufactured by the ancient Araucanians, as the same authority tells us; and it is singular how exactly this form recurs in the pottery of the Cliff-dwellers. Numerous examples are in the Museum of the University of Pennsylvania.

Intentional glazing was probably nowhere developed into a branch of ceramic art on this continent; but partially glazed specimens, of ancient date, are not unusual in Central American collections. Examples are in the Museum just mentioned. They seem to be accidental, owing to an abundance of siliceous matter in the clay.

THE RACIAL GEOGRAPHY OF EUROPE.

THE series of articles on this subject by Professor W. Z. Ripley, in the *Popular Science Monthly*, deserves the attention of all readers interested in questions of modern anthropology. The Europeans of to-day offer a peculiarly complicated problem, owing to the extensive crossings to which all